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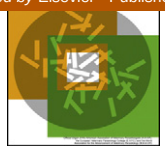

Short communication

FAMACHA© method as an auxiliary strategy in the control of gastrointestinal helminthiasis of dairy goats under semiarid conditions of Northeastern Brazil

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ABSTRACT

This study aimed to evaluate the utilization of FAMACHA© method as an auxiliary strategy to use the individual identification for the selective control of gastrointestinal helminthiasis in naturally infected dairy goats. The experiment was conducted on 63 farms in the towns of Passagem, Quixabá and Cacimba de Areia, semiarid region of the Paraíba state, Brazil. Fifty animals were used on each farm, being visited tree farms per month, totaling 1800 animals, between May 2009 and April 2010. The animals received no anthelmintic treatment for at least four months prior to the farm visits. All animals were subjected to parasitological faecal collection, blood sampling for packed cell volume and the visual/selective exam of the eye colour through the FAMACHA© method. Larvae culture was performed in every assessment on each farm. *Haemonchus* sp. was the most prevalent helminth (80.1%) on larval cultures. The use of this method allowed a reduction of 79.2% on anthelmintic application in dairy goats. The FAMACHA© method proved to be a viable auxiliary strategy to control gastrointestinal helminthiasis of dairy goats from a resource-poor area in the semiarid region of the Paraíba state, Northeastern Brazil.

1. Introduction

Goat farming in semiarid areas in the Northeastern Brazil is an activity of a great socioeconomic importance for small resource-poor producers, where meat and milk are major sources of animal protein. Although numerically significant, goat production on this region still has low productivity due to several factors, including gastrointestinal helminths (Vieira, 1999). The negative impact due to parasite infections may account for slow growth rate, weight loss, decrease of food conversion and milk production, low fertility and in cases of massive infections, high mortality rates.

In this region, producers routinely treat the animals during the rainy season with albendazole, ivermectin moxidectin or levamisole without proper technical assistance. Although not always available the indiscriminate use of the drugs has resulted in the selection of parasite populations that are resistant at their therapeutic dosages (Lima et al., 2010).

van Wyk (2001) have emphasized that due to the spread of resistant parasite populations to most of the anthelmintics, the FAMACHA© method was introduced as a new technique to support parasite control using target selective treatment. The method is based on the principle of the correlation between the eye mucous colour and the hematocrit values (level of anaemia), identifying

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animals that are able to withstand infections by *Haemonchus contortus*. Only animals that have marked clinical symptoms of helminthiasis have to be treated, leaving untreated those who have no clinical anaemia (Molento et al., 2004). Using this approach one would allow the survival of an anthelmintic sensitive parasite population to persist on the environment, without being exposed to anthelmintic treatment, reducing the selection pressure towards resistance.

However, the applicability of the FAMACHA© method is limited because it requires a percentage of *H. contortus* in the herd greater than 60% and needs trained technicians to perform the readings (van Wyk and Bath, 2002). This method has been developed for sheep and only extended to goats, requiring studies to refine and prove its efficiency in these animals (Molento et al., 2004; Vilela et al., 2008).

Therefore, this study aimed to evaluate the FAMACHA© method as an auxiliary strategy for the control of gastrointestinal helminthiasis of naturally infected dairy goats in an important resource-poor area of the semiarid region of Paraíba state, Brazil.

2. Materials and methods

The study was conducted in 63 farms, 56 in Passagem, five in Quixabá and two in Cacimba de Areia, in the semiarid area of Paraíba state, Northeastern Brazil (Fig. 1). The region has a rainy season from January to May (when occurs 90% of annual rainfall) and a dry season from June to December. The annual temperature average is 30.6 °C, ranging from 28.7 to 32.5 °C. The vegetation is predominantly composed by the Caatinga biome (Vilela et al., 2008).

Fifty dairy goats, 1–4 year-old, from each farm were used (3 farms/month) totaling 1800 animals. The experiment was done between May 2009 and April 2010. The total dairy goats were represented by 53% as Saanen, 32% Toggenburg and 15% Anglo-Nubian. All farms had a similar semi-intensive raising system, restricting the usage of anthelmintic treatments for at least four months before the visits.

The parasitological examinations were at the Laboratory of Parasitic Diseases of Domestic Animals, at the Universidade Federal de Campina Grande, city of Patos, Brazil, according to Gordon and Whitlock (1939), for the counting of eggs per gram (EPG) of faeces. Larval culture was performed according to Roberts and O'Sullivan (1950). Blood samples were collected for determining the packed cell volume (PCV).

The FAMACHA© guide was used through the evaluation of the ocular mucosa membranes classification, performed by comparing with a laminated colour chart bearing pictures of sheep classified into five categories ranging from the normal red, through pink to practically white in severe anaemic animals (van Wyk and Bath, 2002).

The frequency of the FAMACHA© correct interpretations were verified by comparing the results obtained with the PCV of each animal. The proportion of success was based on the following PCV references: FAMACHA© score 1 (F1): values ≥28%, F2: 23–27%, F3: 18–22%, F4: 13–17%, and F5: ≤12%. To evaluate the correlation between the breeds of goats and the chart reading success, the 95% confidence interval was determined by Pearson. Means and standard errors (S.E.) for the counting of eggs per gram (EPG) of faeces were calculated for dairy goats in each FAMACHA© score category.

3. Results

The percentage of success on the interpretation of FAMACHA© ranged from 32.6% (May 2009) to 87.5% (April 2010). It was observed a low percentage of correctness for the use of FAMACHA© during the first three months with 32.6, 47.3 and 68%, respectively. The percentage reached a considerable level above 70% after the fourth month of evaluation. The quarter success mean were 49.3% (first quarter), 76% (second quarter), 83.6% (third quarter) and 76.1% (fourth quarter).

The most prevalent helminth in all larval culture was *Haemonchus* sp. (80.1%) followed by *Trichostrongylus* sp. (13.2%) and *Oesophagostomum* sp. (6.7%).

Means and standard errors of EPG were calculated for dairy goats in each FAMACHA© score category (Table 1). There was an increase in the EPG values following the increase in the FAMACHA© score. More than half of the evaluated animals (52%) were classified as FAMACHA© score 2, with a mean of 515 EPG. The results confirm the objective of the method in a semi-arid area of Brazil for not to deworm animals with FAMACHA© scores 1 and 2.

Correlations between the variables are listed in Table 2. Although there was a good correlation between EPG and FAM there was no difference between seasons/months.

PCV and FAMACHA were moderately negative correlated throughout the year as EPG and PCV. The occurrence of such finding may be related with the resilience characteristic of the breed in the region and the adjustment of the FAMACHA into goats.

The factors EPG and FAMACHA and *H. contortus* had a much lower correlation (0.375) during the rainy season as compared to 0.707 during the dry months.

The correlation of treatment, the incidence of *H. contortus*, and rainfall was higher during the rainy season.

4. Discussion

The success of the evaluation rate after the first quarter (mean of 78.5%) are similar to those found by Chagas et al. (2007), who tested the FAMACHA© method in sheep herds in southeastern Brazil. We got a low success rate at the beginning of the use of the FAMACHA© method on the first quarter (mean of 55%) while in the second quarter, the success mean rose to 80%. Molento et al. (2004) attributed the low success rates at the start of the implementation due to the lack of experience of the observers in the conjunctiva colour interpretation as well as the use of the method in goats.

Haemonchus sp. was the most prevalent genus (above 80%). Vilela et al. (2009) had similar prevalence (up to 83%) of this parasite in naturally infected goats by gastrointestinal nematodes in the semiarid region of Paraíba state, Brazil. It was noted that in March 2010, the percentage of *Haemonchus* sp. in larval cultures dropped to 55%. This reduction on *Haemonchus* sp. percentage may have caused

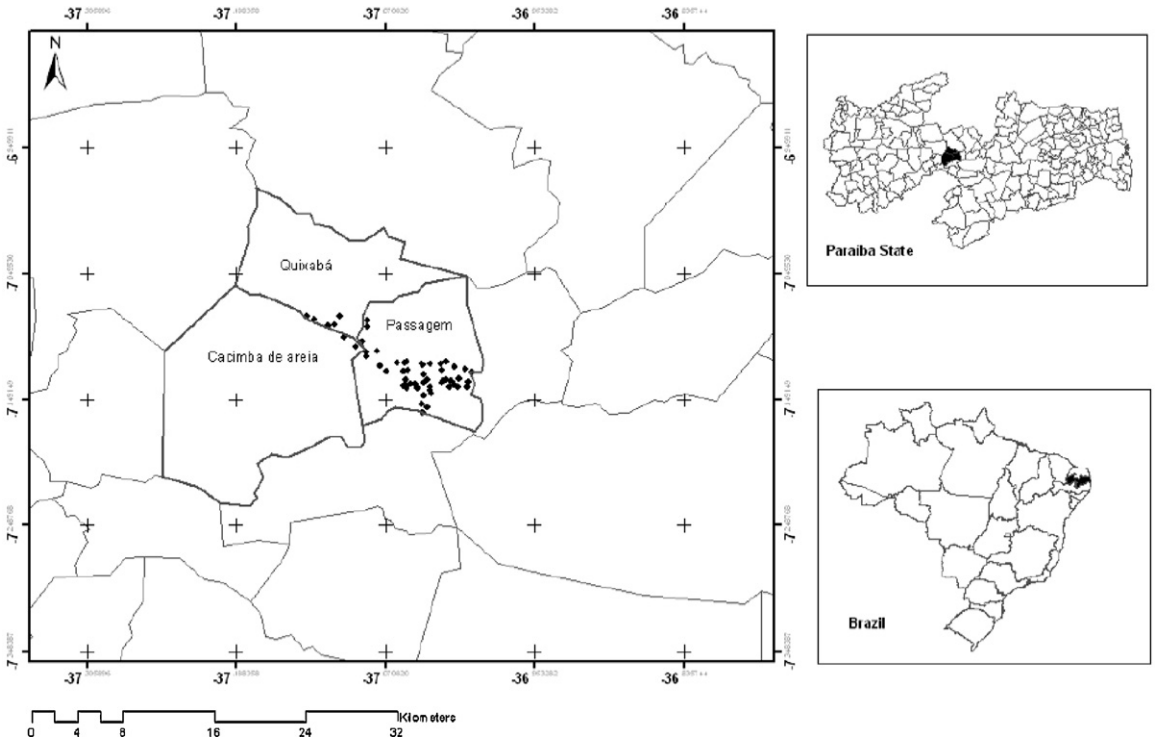

Fig. 1. Area of the study. Black dots indicate the farms in the towns of Quixabá, Caçimba de Areia and Passagem, on the Paraíba state, Brazil.

Table 1
Correlation (*r*) between FAMACHA© score (FAM) and the faecal egg count (FEC) exams of naturally infected dairy goats from semiarid of Paraíba state, Brazil.

FAMACHA© score	Number of animals	Percentage (%)	Mean EPG (S.E.)[a]	*r* FAM-EPG
1	489	27.2	312 (52)	0.76
2	936	52	515 (69)	0.59
3	275	15.2	962 (273)	0.61
4	76	4.2	1868 (306)	0.64
5	24	1.4	3720 (588)	0.73

[a] Standard error.

Table 2
Variables of faecal egg count (FEC), FAMACHA (FAM), packed cell volume (PCV), *Haemonchus contortus* (Hc), treatment index (TI) and rainfall index (Rf) and their correlation observed during May 2009–April 2010 in Paraíba state, Brazil.

	r				
	FEC–FAM	PCV–FAM	EPG–PCV	EPG–FAM-Hc	TI–Rf–Hc
May	0.744*	−0.441*	−0.376*	0.576*	0.748*
June	0.692*	−0.312	−0.388*	0.779*	0.712*
July	0.588	−0.564*	−0.183	0.792*	0.689*
August	0.786*	−0.443*	−0.256	0.782*	0.455
September	0.581	−0.465*	−0.289	0.541	0.367
October	0.793*	−0.398*	−0.171	0.741*	0.390
November	0.612	−0.289	−0.187	0.722*	0.415
December	0.699*	−0.298	−0.365*	0.596*	0.469
January	0.783*	−0.310	−0.280	0.442	0.375
February	0.587	−0.348	−0.276	0.315	0.445
March	0.788*	−0.365	−0.344*	0.278	0.625*
April	0.777*	−0.381	−0.394	0.465	0.716*
Average	0.702	−0.384	−0.292	0.585	0.533

The values followed by * are equal in columns ($P \leq 0.05$) by Pearson analysis.

in this month the decrease of the success percentage (62%) in the interpretation of FAMACHA© chart.

It is a common practice in goat farming to deworm four to six times the entire herd per year in the Northeastern semiarid of Brazil. This indiscriminate use of synthetic anthelmintics cause great economical losses due to the lack of individual evaluations, increases the selection pressure towards parasite resistance and leave residues in meat, milk and in the environment (Lima et al., 2010). In this study, were observed that only 20.8% of the sampled animals had to be dewormed (Table 2). Vilela et al. (2008) reported similar results when conducting preliminary tests using the FAMACHA© method in goats in the semiarid of Paraíba, comparing the values assigned by the FAMACHA© method and the packed cell volume, treating only 20% of the herd. The results of 79.2% of reduction in the use of anthelmintics in the studied animals are similar to Molento and Dantas (2001), who used this method in Brazil during a period of 120 days and reported a reduction of 79.5% on the use of anthelmintic in goats.

The data from this study showed that during 12 months, there was a mean reduction of 79.2% in the application of anthelmintics. Besides this reduction, the FAMACHA© method was able to select the animals which really needed deworming, not exposing the worm population to the anthelmintics. Thus, leaving most of these in *refugia*, which could delay the onset of anthelmintic resistance.

5. Conclusion

The FAMACHA© method demonstrated to be a viable auxiliary strategy to control gastrointestinal helminths of dairy goats in the semiarid areas of Paraíba state, Northeastern Brazil.

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